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PRIME MINISTER'S OFFICE  
NUKU'ALOFA, TONGA.

Magalie Roman Salas  
Secretary to the Commission  
Office of the Secretary  
Federal Communications Commission  
The Portals  
445 Twelfth Street S.W.  
Room TW-A325  
Washington DC 20554  
United States of America

2<sup>nd</sup> March 1999

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FCC MAIL ROOM

Fax No. (00 - 1 - 202 - 418 0307)

Dear Secretary Salas,

**Subject: Notice of Proposed Rulemaking: "Operation of NGSO FSS Ku-band Satellite Systems", ET Docket No. 98-206**

In the subject Notice of Proposed Rulemaking, the Commission solicits comments, *inter alia*, on its proposal to permit non-geostationary satellite orbit fixed-satellite service operations in certain segments of the Ku-band and also on the proposed rules and policies to govern such operations.

The Government of the Kingdom of Tonga, believing that rulemaking in this area by the Commission has great potential to affect and influence the implementation and operation of NGSO systems outside of the national borders of the USA, wishes to comment on the said NPRM.

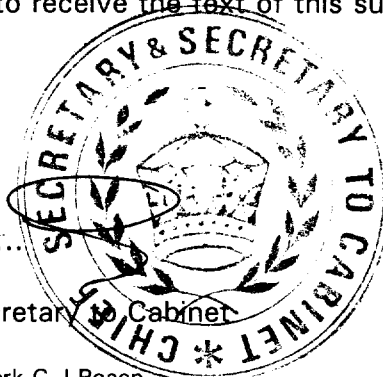
Thus it is with the greatest of respect that I attach to this letter the comments of my Government on some of the issues set out in the subject NPRM.

In order to fulfil the formal requirements of submission, these comments are also being submitted to the Commission electronically, and I have requested the Managing Director of Tongasat, our Agent in these matters, to arrange for you to receive the text of this submission electronically.

Yours sincerely,

Luseane 'Ofa

Acting Chief Secretary and Acting Secretary to Cabinet



CC Mr. Sione Kite  
Managing Director  
Tongasat  
Nuku'alofa  
Tonga  
Fax: 23 322

Mark C J Posen  
Chief Consulting Engineer, Tongasat  
Hadleigh  
England

Fax: 00 44 1473 8284  
No of Copies rec'd  
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Office of the Prime Minister  
Government of the Kingdom of Tonga

In the Matter of	)	
	)	
Amendment of Parts 2 and 25 of the	)	ET Docket No. 98-206
Commission's Rules to Permit Operation of	)	RM-9147
NGSO FSS Systems Co-Frequency with	)	RM-9245
GSO and Terrestrial Systems in the Ku-	)	
band Frequency Range	)	
	)	
and	)	
	)	
Amendment of the Commission's Rules to	)	
Authorise Subsidiary Terrestrial Use of the	)	
12.2 - 12.7 GHz Band by Direct Broadcast	)	
Satellite Licensees and Their Affiliates	)	

## COMMENTS ON NOTICE OF PROPOSED RULEMAKING

### I. INTRODUCTION

1. In its Notice of Proposed Rulemaking, ET Docket No. 98-206 ("NPRM"), Action by Chief, Office of Engineering and Technology, the Federal Communications Commission ("Commission") solicits comments, *inter alia*, on its proposal to permit non-geostationary satellite orbit ("NGSO") fixed-satellite service ("FSS") operations in certain segments of the Ku-band and also on the proposed rules and policies to govern such operations.
2. The Government of the Kingdom of Tonga ("Tonga") wishes to comment on the said NPRM and on the technical and procedural issues involved therein.
3. The Commission is respectfully requested to take these observations and proposals into account when developing its technical, operational and licensing rules applicable to Ku-band NGSO satellite systems.

## II. INTERNATIONAL AND GLOBAL ASPECTS OF NGSO SYSTEMS

4. In her separate statement associated with the NPRM, Commissioner Susan Ness notes that the work on NGSO satellite systems in the International Telecommunications Union ("ITU") stretches "...the limits of our radio spectrum to make possible the delivery of more efficient and innovative communications services for consumers around the world."
5. Tonga strongly supports this view and we note that the new NGSO FSS systems offer the possibility to reuse many times frequency spectrum, already heavily used in the GSO, in order to derive further benefits from this scarce natural resource.
6. *International coverage of NGSO systems.* We note that the NGSO systems are inherently international (global or regional) in their potential coverage, since the low earth-orbit ("LEO"), medium earth-orbit ("MEO") configurations proposed ensure that all satellites, over time, pass over all parts of the earth's surface, whilst the Quasi-geostationary orbit ("Quasi-GSO") systems provide regional coverage in a number of geographically diverse regions. Because of the high costs involved in implementing such systems, the objective of providing a global service essentially becomes an operational imperative. As a consequence most, if not all, NGSO systems, whether they be US-originated or non-US-originated, are really international systems and we assert that it is critically important that the national regulatory actions, both those taking place in the USA and those outside of that jurisdiction, take these international aspects into account.
7. Clearly the operators of US-licensed satellite systems will want to provide service to appropriately licensed earth stations operating in territories outside of the US. The reverse is also true; the operators of non-US-licensed satellite systems will want to provide service to appropriately licensed earth stations operating within the USA.
8. We feel assured that the Commission recognises<sup>1</sup> the need to establish procedures that are transparent and non discriminatory, so that the US national licensing regime does not, from the outset, preclude the possibility for the use of non-US-licensed satellite systems to provide service into the US. In a complementary manner we believe that it is important that the non-US national licensing regimes takes into account the possibility of service provision through US-licensed satellite systems. The Government of Tonga fully supports the Commission in developing its rules under the NPRM, and is confident that the Commission will take due account of the non-US, international systems whilst ensuring that the rules and procedures adopted do not preclude the ability of such systems to provide service to US consumers, nor that the allocation of such spectrum within the US leaves nothing for use by the international systems for the provision of service to US consumers.

## III. CONSIDERATION OF THE DIFFERENT NATURE OF NGSO AND QUASI-GSO SYSTEMS

9. The Government of Tonga is concerned that the Commission appears, in the NPRM, to be treating all classes of NGSO satellite system on an equal footing. However, we assert that one specific class of NGSO systems, the so-called Quasi-GSO systems, cannot be

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<sup>1</sup> See, NPRM ¶ 12

treated under a generic NGSO regime, as the Quasi-GEOs have more in common with the GSO systems than with the generality of NGSO systems.

10. *Definition of Quasi-geostationary orbit satellite systems.* Quasi-geostationary satellite orbits are those which, because of their orbit geometry and satellite phasing, maintain active satellites within relatively small "windows in space" which are geostationary (i.e. approximately stationary relative to points on the earth), even though the satellites operating within these "windows in space" are not themselves, geosynchronous. Such orbits are generally highly elliptical<sup>2</sup> and are usually inclined at large angles from the equatorial plane<sup>3, 4</sup>.
11. *Similarity between GSO and Quasi-GSO systems.* The geostationary "windows in space" of such Quasi-GSO systems may, for the purposes of determining interference into the GSO, be treated in very much the same way as GSO systems, i.e. because each "window in space" is small, the window itself may be treated as a virtual slot with large angular separation from the GSO. The active "window in space" does not move, relative to the surface of the earth and thus, at any point within the service area, the window appears on an essentially fixed azimuth and elevation, as with GSO systems. Earth stations operating to such systems must track the active satellites within their "window in space" but will essentially point in a fixed, and known, direction, again much as with GSO systems<sup>5</sup>. An important consequence of this is that the inter-system interference caused by such Quasi-GSO systems is much more time invariant than that generated by the generality of NGSO systems, again as with GSO systems. Tonga asserts that the Quasi-GSO systems offer an opportunity to re-use many times over, and for many and diverse systems, the FSS spectrum traditionally associated with GSO satellite systems. The use of Quasi-GSO systems presents the World telecommunications community with two bands of "virtual GSO slots" one at about 63° North latitude and one about 63° South latitude, each of which may accommodate numerous separate satellite systems all of which are mutually compatible and, most importantly, compatible with existing and future GSO systems. Given the current overcrowding of the GSO, Tonga asserts that such a valuable natural asset must be protected.. Tonga proposes that the regulatory treatment given to Quasi-GSO satellite systems must be much closer to that given to GSO systems, and specifically that the generality of (non-quasi-GSO) NGSO systems (LEO and MEO) should be required to protect the Quasi-GSO systems to the same degree as they will be

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<sup>2</sup> Hence their alternate name, highly elliptical orbits ("HEO"); we prefer here to use the term Quasi-GSO since not all HEO configurations will exhibit quasi-geostationary properties, and it is only to those that do exhibit such properties that we wish to draw a distinction.

<sup>3</sup> Typically the inclination angle of such an orbit is 63.4 degrees, leading to the "active regions" being quasi-geostationary regions fixed above 63.4 degrees north or south latitude.

<sup>4</sup> Such systems have in the past been used to provide a "geostationary" service to areas of high latitude, to which normal GSO service is either at very low elevation angle or impossible. Much use of these orbits has been made in the past by Russia and these orbit configurations are often known by their Russian names, such as Molniya and Tundra. More recently the advantage of such orbits in providing spectrum reuse away from the GSO has led to an increasing interest in their commercial exploitation.

<sup>5</sup> Perhaps a good comparison is with earth-stations operating to a GSO satellite which is in an inclined orbit.

required to protect the GSO systems. If this is not the case then the use of the "virtual GSO slots", described above, may be sterilised.

12. *Spectrum sharing amongst multiple NGSO systems.* As a consequence of 11 above, Tonga notes, and is supportive of, the positions noted in the NPRM by some of the applicants (for example at ¶ 68) that the LEO NGSO systems should be required to take avoiding action to protect the Quasi-GSO systems, similar to that required to protect the GSO systems.
13. *Protection of GSO FSS Ku-band systems.* Whereas the generality of low orbit NGSO systems need to take specific avoiding action<sup>6</sup> to protect the GSO systems (see for example NPRM at ¶ 75) the Quasi-GSO systems are inherently protecting of the GSO systems because of the large geocentric angular separation (generally in excess of 45°) of the active "window in space". Again because of this large angular separation, we have no hesitation, *a priori*, in asserting our confidence that the Quasi-GSO systems will easily be able to satisfy the sharing requirements based on pfd, epfd and apfd limits<sup>7</sup>, as are being developed in the context of ITU Task Group 4-9-11 or those (perhaps different) US national pfd, epfd and apfd limits which may arise out of the present NPRM process.
14. *Global coverage requirement.* In NPRM at ¶ 84 the Commission proposes that all Ku-band NGSO systems meet a coverage requirement, being capable of serving "locations as far North as 70 degrees latitude and as far south as 55 degrees latitude for at least 75% of every 24 hour period" which we refer to as the "global coverage requirement". The Government of Tonga believes that the general adoption of such a rule mitigates against the Quasi-GSO systems, which, by the nature of their technical design are optimised to provide regional coverage over portions of the Northern or Southern hemisphere but which, in general, will not be capable (at least for a single system) of providing "seamless global" coverage. Indeed a single "window in space" for a Quasi-GSO system provides a "hemispherical" coverage very similar to that provided by a single satellite in the GSO. As a consequence we are not supportive of the application of the "global coverage requirement" to Quasi-GSO systems which, clearly does not allow the development of a satellite system which has been optimised to meet both market and economic requirements. The Kingdom of Tonga proposes that the "global coverage requirement" should not apply to Quasi-GSO systems.

#### IV. PROPOSALS

15. It is with great respect that the Government of the Kingdom of Tonga wishes to offer the following proposals to the Commission for consideration in their rulemaking relating to Ku-band NGSO systems:
16. *Due account of international systems.* Tonga is confident that the Commission recognises that its rulemaking should take due account of the fact that there will be non-US licensed NGSO systems which US licensed earth station operators will wish to use for

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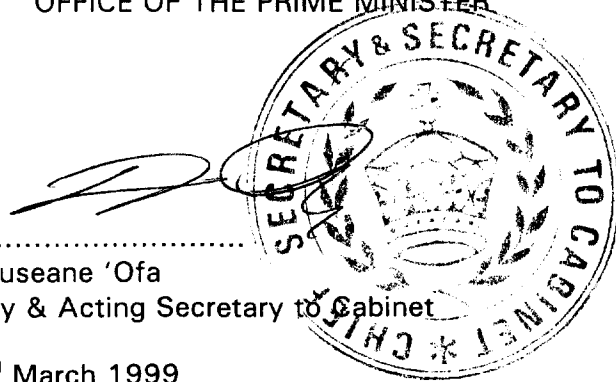
<sup>6</sup> For example, one LEO NGSO system proposal submitted to the Commission states that its earth stations would not transmit to an NGSO satellite within  $\pm 10^\circ$  of the GSO arc and that its satellites will cease transmission when they are within  $\pm 10^\circ$  of the GSO arc.

<sup>7</sup> See, NPRM at ¶ 4.

the provision of FSS telecommunications services to US consumers. We are confident that that, in as much as the use of such non-US licences systems to provide services into the US is envisaged and allowable<sup>8</sup> then the Commission will ensure that any rulemaking for these NGSO systems does not reserve the access to the satellite/orbit resource exclusively for US licensed systems. Specific proposals are given in 9 above.

17. *Due account of Quasi-GSO systems.* Tonga is confident that the Commission will recognise that the rulemaking should take account of the special technical nature of the Quasi-GSO class of NGSO orbits. Rules should not be adopted which make it impossible to utilise Quasi-GSO systems in the Ku-band (e.g. the "global coverage" requirement) or which stifle the development of Quasi-GSO systems. Specific proposals are given in 11 and 14 above.

GOVERNMENT OF THE KINGDOM OF TONGA  
OFFICE OF THE PRIME MINISTER



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Luseane 'Ofa

Acting Chief Secretary & Acting Secretary to Cabinet

2<sup>nd</sup> March 1999

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<sup>8</sup> For example, under the provisions of the "DISCO II Report and Order", IB Docket No. 97-111, 12 FCC Rcd 24094 (1997).